



FAA-E-2380
January 22, 1969

DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION SPECIFICATION

VOICE FREQUENCY TELEGRAPH TERMINAL EQUIPMENT

1. SCOPE

1.1 Scope. - The equipment specified herein is a solid-state, frequency shift-keyed, voice frequency, telegraph terminal for use over long distance, high frequency radio paths requiring diversity operation. It is the intent of the Government to procure commercially produced equipment under this specification.

2. APPLICABLE DOCUMENTS

2.1 FAA standards. - The following FAA standard of the issue specified in the invitation for bid forms a part of this specification:

FAA-STD-013

Quality Control
Program Requirements

2.2 Military documents. - The following Military specification of the issue in effect on the date of the invitation for bid forms a part of this specification.

MIL-E-17555

Electronic and Electrical
Equipment and Associated
Repair Parts, Preparation
for delivery of

(Copies of FAA standards, specifications, and military specifications may be obtained from the Contracting Officer in the Federal Aviation administration office issuing the invitation for bids or request for proposals. Requests should fully identify material desired, i.e., specification numbers, dates, amendment numbers; also, request should state the contract involved or other use to be made of the requested material.)

3. REQUIREMENTS

3.1 Equipment to be furnished by the contractor. - The contractor shall furnish telegraph terminal sets in any of the following configurations if ordered. Each configuration shall include an equipment cabinet, patch field, test facilities, fuse and alarm unit, loop battery, and loop control panel.

- a. 16 channel, full-duplex, frequency division multiplex voice frequency telegraph terminal with dual and selectable fourth order diversity capability in a single, wired, 19-inch wide equipment cabinet. Cabinet height shall not exceed 92 inches.
- b. Same as (a), but equipped for non-diversity reception. However, all cabinet wiring, shelf-space, card holders, patch fields, and any other common materiel shall be provided for future conversion to (a) configuration.
- c. Same as (a), but equipped for transmit operation only. Wiring and shelf space for conversion to (a) configuration is not required.
- d. Same as (a), but equipped for receive operation only. Wiring and shelf space for conversion to (a) configuration is not required.
- e. Same as (d), but equipped for non-diversity reception. However, all cabinet wiring, shelf space, card holders, patch fields, and any other common material shall be provided for future conversion to (d) configuration.

All contractor furnished equipment shall be commercially produced and of proven design.

3.1.1 Instruction books. - Commercial type instruction books shall be provided in the quantities specified in the contract.

3.2 Telegraph terminal. - Each telegraph terminal set furnished shall meet the requirements listed in the following subparagraphs.

3.2.1 General design criteria

3.2.1.1 Solid-state design. - Each telegraph terminal set shall be completely transistorized and of solid-state design with the exception of input and output circuitry, which may employ mercury wetted relays. The equipment shall be of modular plug-in construction. Keyed printed circuit card extenders shall be provided to facilitate troubleshooting. All major test points and operator controls required for operation and routine maintenance shall be accessible from the front of the equipment cabinet.

3.2.1.2 Interchangeability. - All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable.

3.2.2 Channel capacity. - Each set of terminal equipment shall consist of 16 telegraph channels arranged in the configuration specified in the contract (3.1a, b, c, d, and e).

3.2.3 Modulation. - Tone transmitters shall be frequency shift-keyed ± 42.5 Hz above and below the channel center frequency and shall operate at any keying speed up to and including 75 baud (100 wpm).

3.2.4 Channel frequency configuration. - The 16 telegraph channels shall have 170 Hz center frequency spacing from 425 to 2975 Hz and shall operate over a nominal 3 KHz speech circuit (HF radio sideband).

3.2.5 Distortion. - The total distortion introduced by the equipment shall not exceed 5% at 75 baud (5-level, 100 wpm keying) on any channel when connected back-to-back with random keying on adjacent channels.

3.2.6 Diversity Operation. - Terminals equipped for diversity operation shall provide 16 channels of dual diversity or eight channels of quad diversity. Mode selection shall be manually selectable.

3.2.7 Tone keyers. - Individual tone keyers shall be provided for each channel.

3.2.7.1 Input keying. - Keyer inputs shall be electrically floating and shall accept DC signals, 10 to 100 milliamps, up to 150 volts, neutral, positive or negative. Loop battery shall be provided (See 3.1, and 3.2.8.2 for redundancy requirements.)

3.2.7.2 Frequency stability. - Frequency drift shall not exceed 0.1 Hz from nominal for $\pm 10\%$ line voltage variation or more than 1.0 Hz from nominal over a temperature range of -50°F to 155°F .

3.2.7.3 Output. - Keyer output shall be a frequency shifted sine wave adjustable from -5 to -30 dbm. Output impedance (combined 16 channels) shall be 600 ohms.

3.2.8 Tone receiver. - Individual tone receivers shall be provided for each channel (two each for diversity equipped terminals 3.1 a & d).

3.2.8.1 Input. - Tone receivers shall cater to input levels of +5 to -45 dBm. Input impedance shall be 600 ohms.

3.2.8.2 Output. - Tone receiver output shall provide for receive loop keying, neutral, negative battery, 60 mA, 120 volts into 2000 ohms. Loop current shall be provided as part of each telegraph terminal. If common loop power supplies are furnished, 100%, automatically switched, standby shall be provided. If individual channel loop power supplies are furnished, standby units will not be required.

3.2.8.3 Output signal distortion. - Signal bias shall be manually adjustable to 0 bias from 10% marking or spacing.

3.2.8.4 Phase delay compensation. - In diversity mode of operation, a phase delay compensation adjustment shall be provided to compensate for up to 5 milliseconds of delay between diversity channels.

3.2.9 Diversity comparators. - Terminals equipped for diversity operation (3.1 a & d) shall be supplied with receiver compatible (3.2.8) diversity comparators for optimum signal selection by signal level comparison.

3.2.10 Power source. - The equipment shall meet all requirements with a supply voltage of 115/230 V AC 50/60 Hz.

3.2.11 Patch fields. - Each telegraph terminal shall be arranged to provide the maximum of patching flexibility with the minimum of jack space. A minimum of VF send and receive, line, equipment and monitor jacks shall be provided for each circuit. Patch cords with appropriate plugs shall be provided with each telegraph terminal set for eight telegraph channels. Patching shall provide for the observation, isolation and transfer of all major system elements.

3.2.12 Test facilities. - Each telegraph terminal set shall contain a test panel with the following equipment as a minimum.

- (a) Level meter for measuring the complete range of input and output VF signal levels (individual and composite) calibrated in dBm.
- (b) Loop current meter with a zero center reading scale.
- (c) 50 and 75 baud dot generator
- (d) Phase delay metering circuit for comparing transition time between two signal converters in diversity operation.

3.2.13 Fuse and alarm panel. - Each telegraph terminal set shall contain a fuse and alarm panel for telegraph loop battery distribution. Each loop circuit shall be fused. Visual indicating fuses shall be provided. Alarm indicating lamps and a bell or buzzer alarm shall be provided. The audible alarm shall have an independent on-off switch.

3.2.14 Loop control panel. - Each telegraph terminal set shall contain series loop controls to provide loop current adjustment for each telegraph loop circuit. Controls shall be screwdriver adjustable 2500 ohm, 25 watt potentiometers.

3.2.15 Power distribution panel. - Each telegraph terminal set shall contain a primary AC power distribution panel for two AC circuits, one serving the telegraph terminal equipment the other a 15A duplex convenience outlet. Both circuits shall be individually fused. A common on-off switch shall be provided.

3.2.16 Environmental conditions. - All performance requirements shall be met with any ambient temperature of 0° to 50° C (except for frequency stability; see 3.2.7.2) and any relative humidity up to 95 percent.

4. QUALITY ASSURANCE PROVISIONS

4.1 General inspection provisions. - The contractor shall provide and maintain an inspection program in accordance with FAA-STD-013, Quality Control Program Requirements.

4.2 Notification of readiness for inspection. - When the contractor has one or more production equipments completed, i. e., equipment produced to meet all contract requirements, he shall notify the Government Contracting Officer in writing that he is ready for Government inspection. Such notification shall be given in time to reach the Government Contracting Officer not less than five work days before the contractor desires inspection to start.

5. PREPARATION FOR DELIVERY

5.1 General packing requirements. - See MIL-E-17555

6. NOTES

6.1 Note on information items. -

6.1.1 Instruction books. - Quantities of instruction books to be furnished with the equipment and the requirements for any additional instruction books will be specified in the contract schedule.

